Nantucket Infectious Disease Report

Jan 2009- Dec 2018

Nantucket Health Department

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Infectious Disease

Infectious disease is defined by the World Health Organization as "a disease caused by pathogenic microorganisms such as bacteria, viruses, parasites or fungi." Infectious diseases can be spread from person to person or by other vectors like animals or insects. A comprehensive analysis of infectious disease on Nantucket has been conducted and the following diseases were found to be the most prevalent between January 2009 and December 2018.

Nantucket Top Five

1. Lyme Disease, 71%
2. Babesiosis, 17%
3. Hepatitis C, 5%
4. Human Granulocytic Anaplasmosis, 5%
5. Influenza, 2%

Note that three of the top five infectious diseases on Nantucket are tick-borne illnesses. These include Lyme disease, Babesiosis, and Human Granulocytic Anaplasmosis. Together they account for 93% of total infectious disease on Nantucket from 2009-2018.

The following infectious diseases are reported in order of prevalence from 2009-2018 starting with the most prevalent and ending with the least prevalent reportable infectious disease according to Nantucket and Massachusetts Department of Public Health data.

Lyme Disease

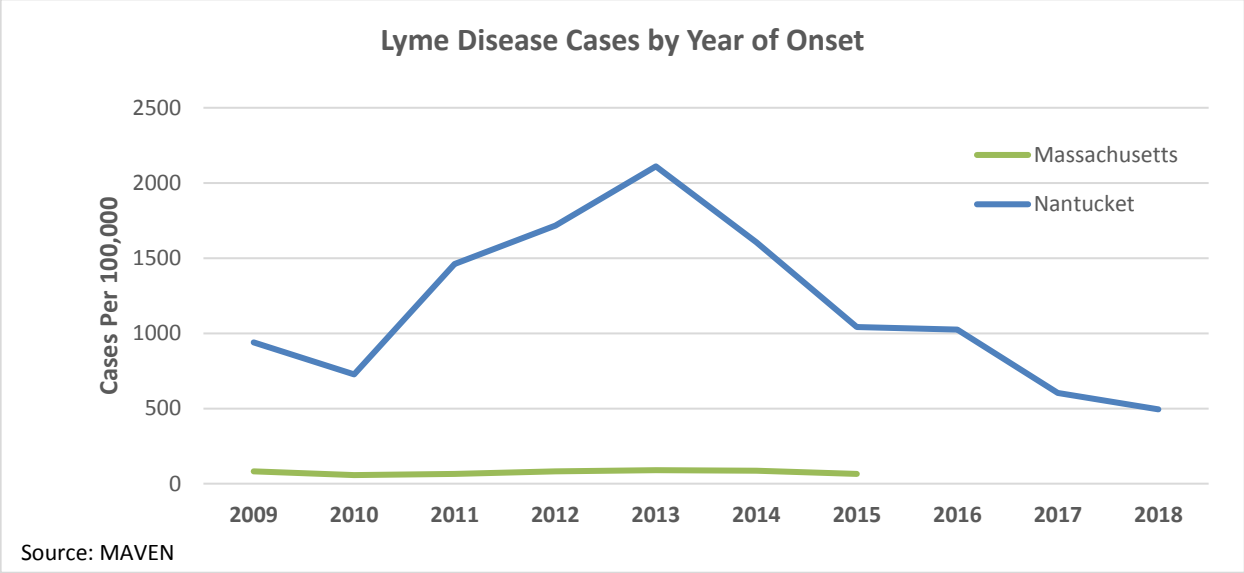
Lyme disease is caused by a bacterium called *Borrelia burgdorferi*, as reported by the Centers for Disease Control and Prevention (CDC). This bacterium is spread to humans through the bite of an infected blacklegged or "deer" tick. Early symptoms of Lyme include flu-like symptoms such as fever, headache and fatigue. If left untreated, Lyme disease can spread to a person's heart, joints, and nervous system. This can lead to serious and lifelong implications like arthritis, irregular heartbeat, inflammation of the brain and spinal cord, problems with short-term memory, and many more.

Although the implications for untreated Lyme disease can be severe, it is easy to prevent this kind of infection with proper education. The best way to prevent Lyme disease is to take precautions before even encountering ticks. Wear long sleeves and pants when spending time in a wooded area, use insect repellent that contains DEET, and check yourself and your clothing for ticks after being outside. Be especially cautious of ticks during the warmer months.

Nantucket has a much higher burden of Lyme disease when compared to the rest of the state. Lyme disease accounts for 71% of all infectious disease on Nantucket. When compared to the other tick-born illnesses found in Massachusetts (Babesiosis, Human Granulocytic Anaplasmosis, Borrelia Miyamotoi Infection, and Tularemia), Lyme is the most common at the state level and on Nantucket. To assess a person's risk of contracting Lyme disease one should consider the three factors highlighted in the following charts.

By Year of Onset

Figure 1



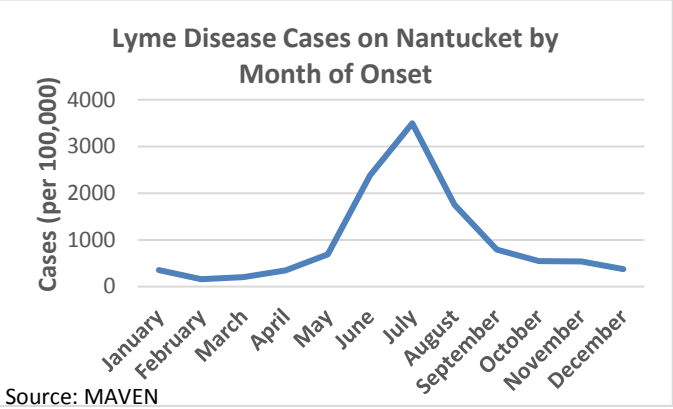
Since 2009, the prevalence of Lyme disease has changed significantly. The Lyme disease rates on Nantucket doubled from 2010 to 2013 and then sharply decreased until 2015 when the decline slowed (Figure 1). In 2018, the incidence rate on Nantucket was the lowest reported in the last nine years at 494.4 per 100,000. The highest reported incidence rate on Nantucket was in 2013 at 2110.3 per 100,000. The highest incidence rate statewide was also in 2013 at 89.9 per 100,000.

At the state level, incidence rates are much lower with a cumulative incidence rate of 521.58 per 100,000 compared to 11623.91 per 100,000 on Nantucket. As seen in Figure 1, statewide Lyme data discontinues after 2015. This is because the Massachusetts Department of Public Health discontinued case-based Lyme disease surveillance in 2016 and began exploring alternative data sources. These data sources are being analyzed and will be incorporated into future reports.

By Month of Onset

Figure 2 demonstrates Lyme disease cases per 100,000 by month of onset of disease. As seen in the figure, there is a significantly increased risk of contracting Lyme disease in the summer months, especially July (3496.5 per 100,000). This is due to an increased tick population and people spending more time outdoors. The month with the lowest number of new Lyme cases is February with an incidence rate of 158.1 per 100,000.

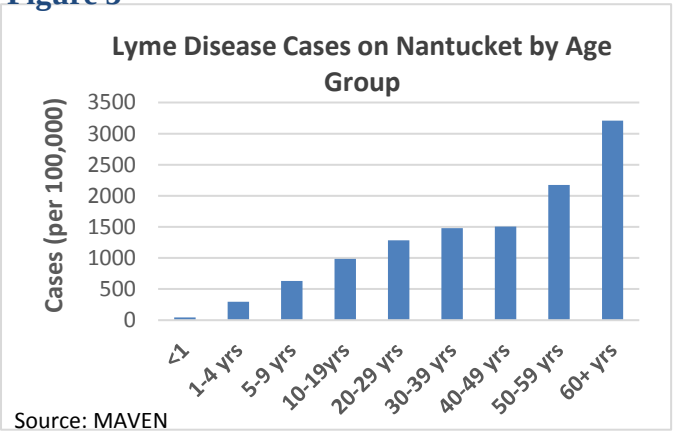
Figure 2



By Age Group

Lyme disease is a risk for anyone who may encounter an infected tick, however there are certain age groups that show higher rates of Lyme disease than others. On Nantucket, there is a positive correlation between Lyme disease and older age (Figure 3). There were no cases reported in children under one year of age between 2009 and 2018. The largest burden of Lyme disease is shown in the over sixty population at 3208.2 per 100,000 (Figure 3).

Figure 3



Common practices for controlling Lyme disease in larger populations includes wide-scale permethrin sprays and deer reduction. Permethrin is a chemical spray that is deadly to mosquitoes and ticks. It is also reportedly deadly to cats and some other wildlife. Controlling the deer population is an effective way to control and reduce the tick population over time. Ticks of reproductive age feed on larger mammals like deer, dogs and humans. According to the Massachusetts Lyme Commission, one adult female tick can produce over 2000 eggs just from one meal. Reducing the number of deer on Nantucket through controlled hunting may have a significant impact on reducing the number of ticks on island and subsequently reduce tick-borne illness.

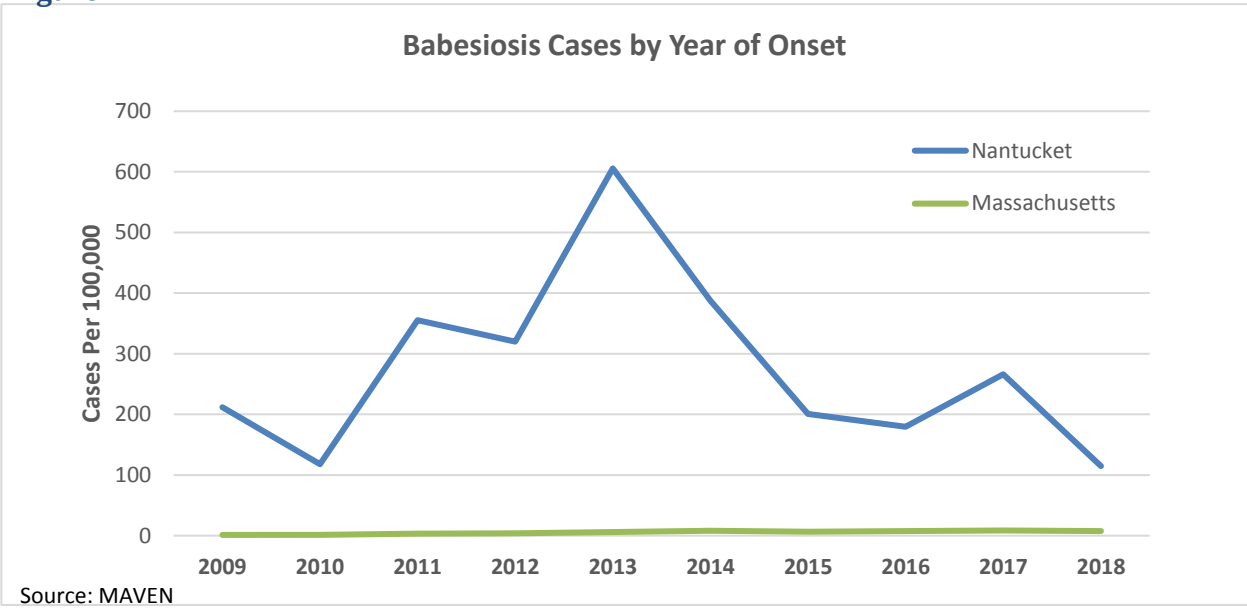
Babesiosis

Babesiosis was the second most prevalent infectious disease on Nantucket between 2009 and 2018 (17%). It is caused by microscopic parasites that infect red blood cells. These parasites are spread to humans and animals by blacklegged or "deer" ticks. People infected with babesiosis experience flu-like symptoms. Some people never show symptoms of Babesiosis and do not need treatment. However, for those that do show symptoms, treatment is available and successful. If left untreated, Babesiosis can be deadly for those who may have a weakened immune system such as infants, elderly, and those undergoing other treatments such as chemotherapy.

Just like Lyme disease, Babesiosis is more prevalent during the warmer months (see figure 5) and proper prevention should be followed. This includes using insect repellent with DEET or permethrin, checking yourself and your clothes for ticks, and wearing long sleeves and long pants in wooded areas. As seen in Figure 4, Nantucket has a much higher burden of babesiosis when compared with the state. Nantucket has a cumulative incidence of 2743.24 per 100,000 while that state has a cumulative incidence of 55.05 per 100,000.

By Year of Onset

Figure 4



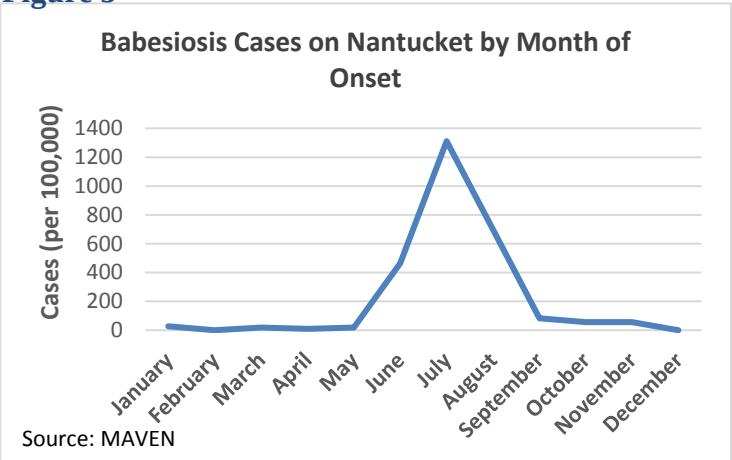
Source: MAVEN

New cases of babesiosis on Nantucket peaked at an incidence rate of 605.7 per 100,000 in 2013; the same year that Lyme disease peaked. For Massachusetts, the highest incidence rate was in 2017 (8.6 per 100,000). As you can see in Figure 4, cases of babesiosis on Nantucket significantly increased between 2010 and 2013. The incidence rate in 2010 was 118.0 per 100,000 and 605.7 in 2013. Fortunately, the upward trend ended in 2013 and new cases of babesiosis greatly decreased, reaching the lowest point in 2018 at 114.8 per 100,000. The rates of babesiosis at the state level have remained steady with a peak in 2017 (8.6 per 100,000) and low point in 2010 (1.4 per 100,000).

By Month of Onset

As seen in Figure 5, cases of Babesiosis peaked during the warmer months like they did for Lyme disease. Cases increased in June and peaked in July at 1311.2 per 100,000. New cases decreased significantly starting in August and leveled out starting in September. The spike in babesiosis cases can be attributed to a new population of adult ticks (who feed on humans) and increased time spent outside. The life cycle of a black-legged tick is approximately three years according to the CDC. In their first year of life, they feed off smaller mammals such as birds and mice. Adult ticks prefer to feed on larger mammals (deer, dogs, and humans). Although adult ticks prefer to feed from humans, a tick at any life stage can be a threat to spreading disease.

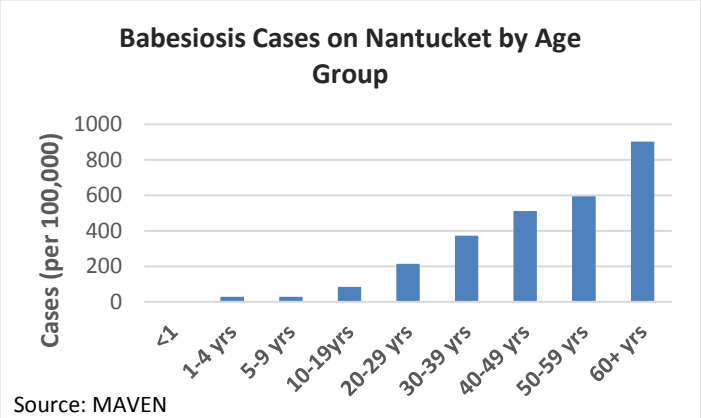
Figure 5



By Age Group

Babesiosis can affect a person of any age just like Lyme disease, however it seems to affect the older population on Nantucket. The over sixty population had the most cases of babesiosis at 902.0 per 100,000. This positive correlation between age and cases of babesiosis is very similar to the age distribution of Lyme cases (Figure 6, Figure 3).

Figure 6

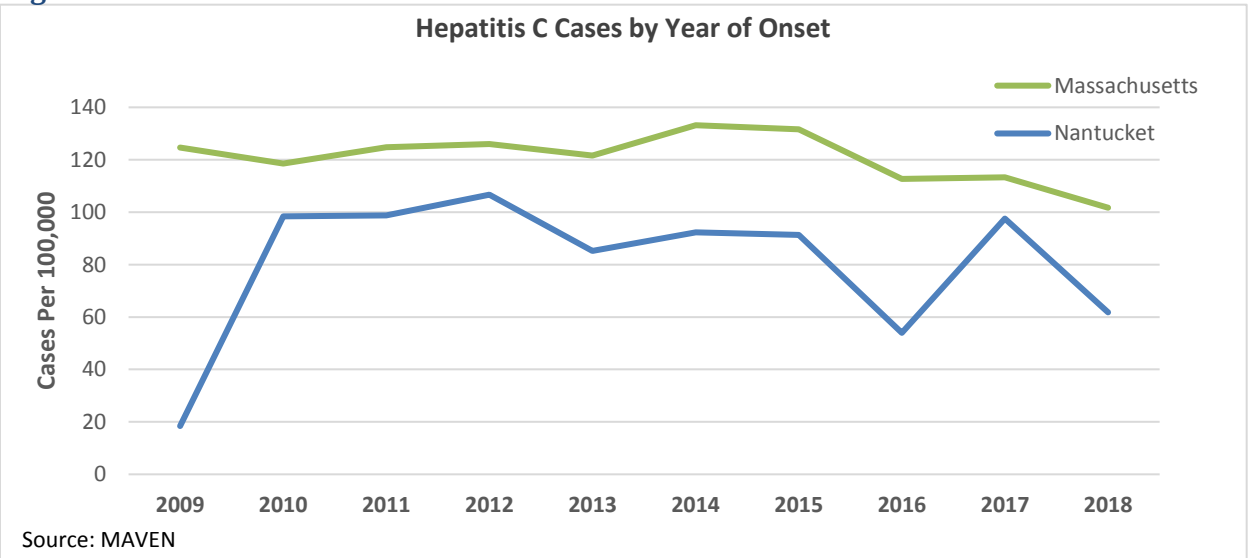


Hepatitis C

Hepatitis C is a virus that causes infection and inflammation of the liver. There are five types of hepatitis, however types A, B and C are the most common in the United States. On Nantucket and at the state level, the most common is Hepatitis C. Types A and B have vaccines while Hepatitis C does not. Hepatitis C is an acute (short-term) illness for up to 25% of infected patients according to the Centers for Disease Control and Prevention. For the other 75% of infected patients, Hepatitis C is chronic (long-lasting). This virus is spread when the blood from an infected person enters the body of someone who is not infected. The most common mode of transmission is through shared needles. Some other common types of transmission are childbirth if the mother is infected with the virus, sexual contact with an infected person, and getting a tattoo or piercing in an unregulated setting.

By Year of Onset

Figure 7

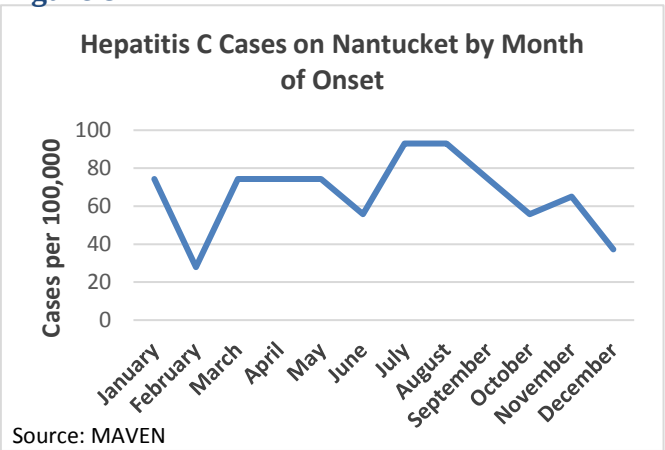


Unlike Lyme disease and Babesiosis, Massachusetts has a higher incidence of Hepatitis C when compared to Nantucket. Massachusetts has a cumulative incidence rate of 1207.24 per 100,000 while Nantucket has a cumulative incidence rate of 799.72 per 100,000. Hepatitis C peaked in 2014 at the state level with an incidence rate of 133.2 per 100,000 while Nantucket cases peaked in 2012 at 106.7 per 100,000. There was a significantly low number of cases on Nantucket in 2009 (18.4 per 100,000) (see Figure 7). The lowest incidence of Hepatitis C at the state level was in 2018 at 101.7 per 100,000. Although Massachusetts has seen a decline in cases since 2015, Nantucket had a recent spike in 2017. Between 2017 and 2018 on Nantucket, cases decreased again. To determine if this is a permanent decline in Hepatitis C, we should continue surveillance to better understand the most recent changes in incidence rates.

By Month of Onset

Figure 8 displays Hepatitis C cases by the month of onset of disease on Nantucket. There is an inclining rate of cases from February to August and a decline from September to December. The peak incidence of cases occurs in July with a rate of 93.0 per 100,000. The lowest incidence rate occurred in February with a rate of 27.9 per 100,000.

Figure 8

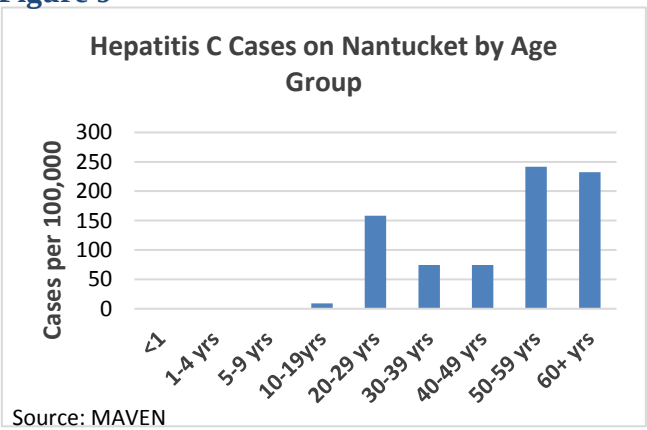


Source: MAVEN

By Age Group

The age distribution of Hepatitis C on Nantucket does not follow a perfect correlation pattern like the previous two diseases did (Figure 9). The highest incidence occurs among people aged 50-59 years (241.8 per 100,000). Next are people aged 60+ (232.5 per 100,000) and 20-29 years (158.1 per 100,000). There are no cases reported in children under the age of 10 (Figure 9).

Figure 9



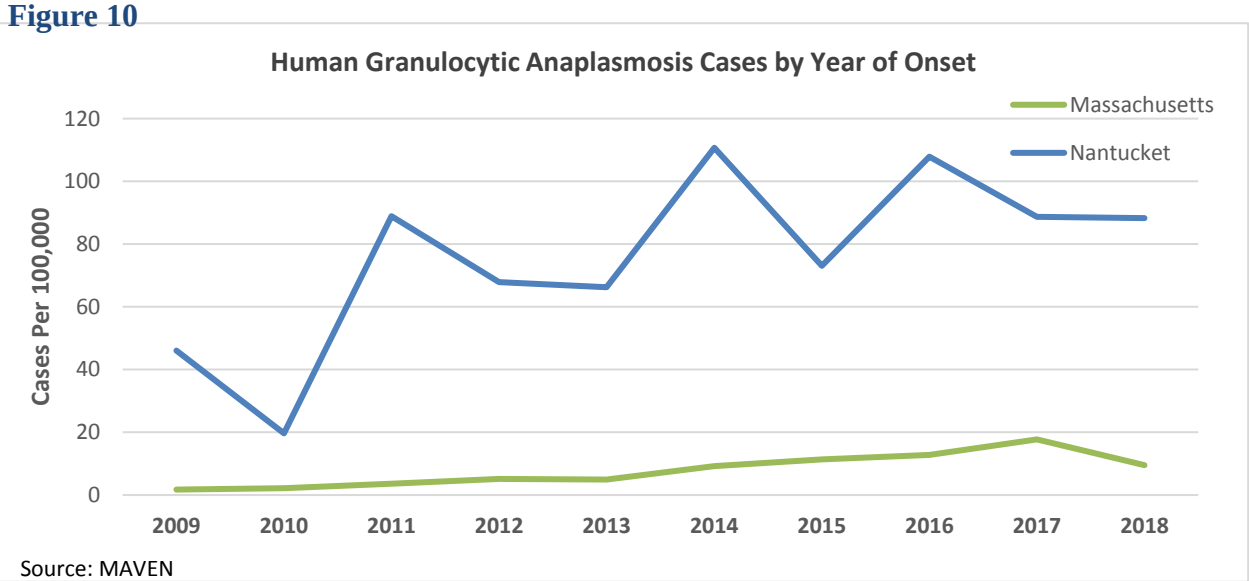
Source: MAVEN

Human Granulocytic Anaplasmosis

Human Granulocytic Anaplasmosis (also known as Anaplasmosis) is a virus caused by a bacterium called *Anaplasma phagocytophilum* according to the Centers for Disease Control and Prevention. In the northeast, this virus is spread by infected blacklegged or "deer" ticks. Similarly, to Lyme disease and Babesiosis, Anaplasmosis is more common in the warmer months and is completely preventable when proper precaution is followed. Early symptoms of Anaplasmosis are fever, headache, nausea/vomiting. Late stage symptoms can be very dangerous and include respiratory failure, bleeding problems, organ failure, and even death.

By Year of Onset

Figure 10



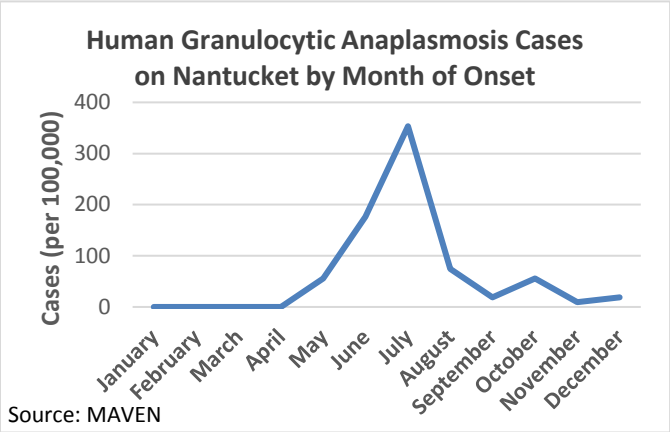
Source: MAVEN

Nantucket has a higher incidence of Human Granulocytic Anaplasmosis when compared to the state level (762.62 per 100,000 compared to 79.00 per 100,000 respectively). Both Nantucket and Massachusetts are looking at upward trends when it comes to Anaplasmosis. Since 2009, incidence rates have been increasing steadily until its peak in 2017 at 17.7 cases per 100,000. Cases decreased in 2018 for the first time since 2009. On Nantucket, incidence rates have been increasing over time, however the increase has not been as steady. The lowest incidence rate reported for Nantucket was in 2010 at 19.7 per 100,000. The highest incidence rate was reported in 2014 at 110.7 per 100,000. Since 2016, rates of Human Granulocytic Anaplasmosis have been declining slowly. From 2017 to 2018 the incidence rate decreased but only by 0.5 cases per 100,000.

By Month of Onset

Just like the other tick-born illnesses present on Nantucket (Lyme and Babesiosis), Human Granulocytic Anaplasmosis is more prevalent in the warmer months. Cases peak in July with an incidence of 353.4 per 100,000. Interestingly, there is another spike of cases in October which is unusual for most tick-born illnesses since ticks are more active in the Spring and Summer. In this case, there could have been a warmer than usual Fall or a late onset of symptoms.

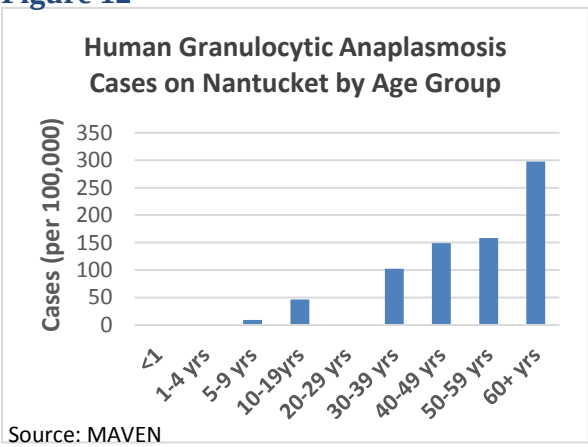
Figure 11



By Age Group

There is a clear correlation between Human Granulocytic Anaplasmosis and older age. The most cases of HGA on Nantucket between 2009-2018 were reported in the over 60 age group. There were no cases reported in children under 5 or in young adults ages 20-29. Other than the 20-29 ages group, there is a clear positive correlation between age and Human Granulocytic Anaplasmosis. Cases of Lyme disease and Babesiosis have also followed this trend.

Figure 12



Human Granulocytic Anaplasmosis is carried by the blacklegged or "deer" tick which also is a carrier for Lyme disease and Babesiosis. Blacklegged ticks are the most common type of ticks found in the northeast region of the US and on Nantucket. They are most active in the Spring and Summer months due to warmer temperatures and their need for food to reproduce. Preventing tick bites can be simple if certain precautions are taken. These include spraying your clothes with DEET or permethrin, doing daily tick checks, treating your animals for ticks and checking them before they bring ticks into the house. Other ways to protect your property from ticks includes regularly cutting grass and brush around your yard, and supervised application of pesticides.

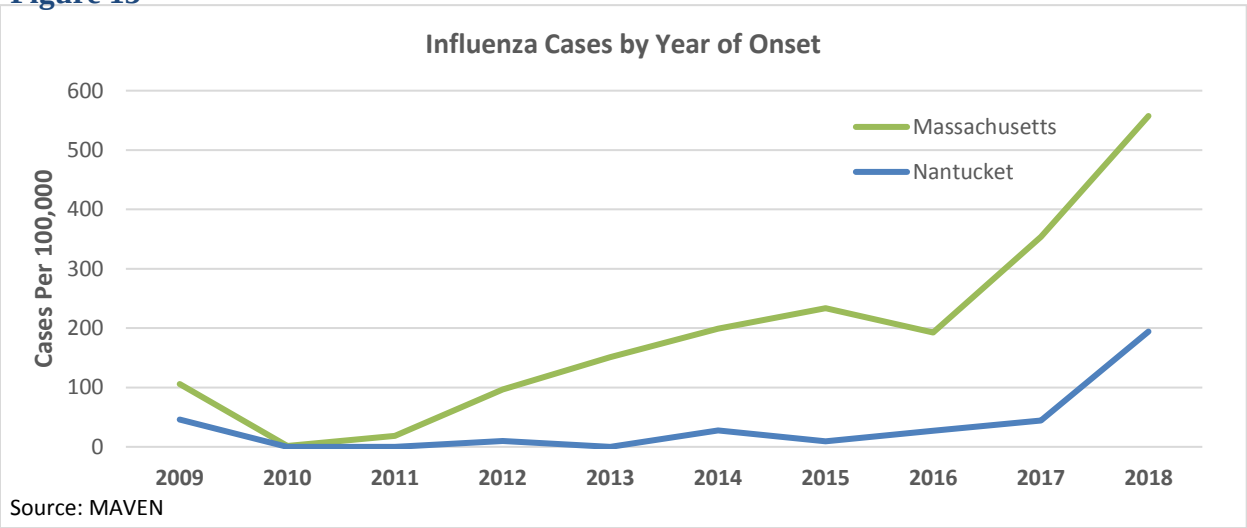
Influenza

Influenza (flu) is a very contagious respiratory virus caused by influenza viruses. Symptoms include fever, cough, muscle aches, and some may experience diarrhea/vomiting. Influenza is mostly a mild virus but can become life threatening to vulnerable populations like infants, elderly, and people with a weakened immune system.

There are yearly influenza vaccinations which aim to prevent the virus and can lessen symptoms for people who may still contract it. Since there are multiple types of the influenza virus, vaccinations may not be 100% effective, however they reduce one's risk of contracting the flu by 40-60% according to the Centers of Disease Control and Prevention. It is recommended that people get vaccinated in October or November since the flu is most commonly contracted in the winter months. As seen in Figure 13, Nantucket had its highest number of case of influenza in December.

By Year of Onset

Figure 13

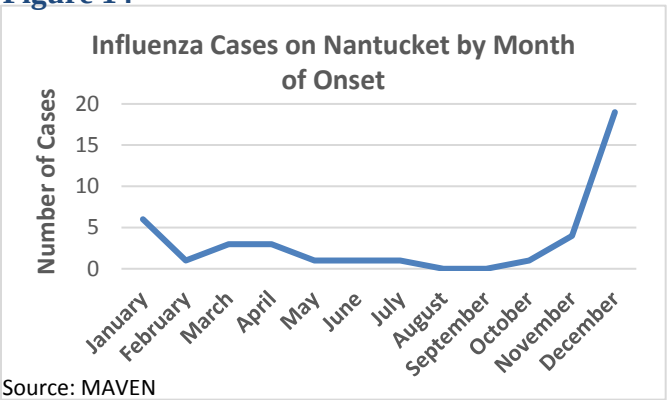


Source: MAVEN

Massachusetts has an overall higher incidence of influenza when compared to Nantucket. In 2010, incidence rates of influenza were very similar on Nantucket and statewide (0 cases per 100,000 and 1.5 cases per 100,000 respectively). In 2011, incidence rates in Massachusetts increased at a much faster rate than on Nantucket. There was a brief decline from 2015 to 2016 before cases increased at a much faster rate from 2016 to 2018. On Nantucket, there was a brief increase in influenza cases in 2014 and a big increase from 2017 to 2018. Both Nantucket and Massachusetts reached a peak in 2018, Nantucket with an incidence rate of 194.2 per 100,000 and Massachusetts with an incidence rate of 557.3 per 100,000. There was a significant increase in the number of influenza cases in 2016 for Massachusetts and 2017 for Nantucket. This could be the result of many things such as better case reporting, less effective vaccines or lower rates of vaccination to name a few.

By Month of Onset

Figure 14

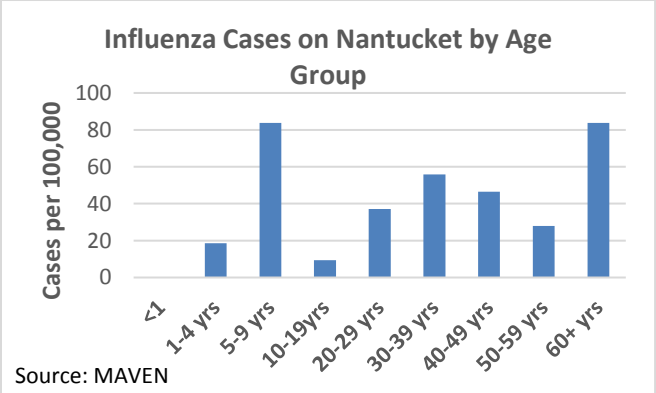


Source: MAVEN

Although influenza is a virus that can be spread year-round, it is more common in the winter months. Nantucket had the highest number of cases in December and January. The lowest incidence was reported in September. There was a slight spike in cases in March and April which is common when the spring is colder than normal. Influenza is very contagious, so when people are in close quarters with others, they have a higher chance of being exposed to the virus. In Massachusetts, flu vaccinations are required for school children however vaccinations do not stop the virus from spreading completely. Since there are many types of the flu, the vaccine is only effective for a portion of flu viruses each year. Through extensive research, vaccines are developed yearly with the hope of preventing as many cases as possible. According to the CDC, the flu vaccination has a 40-60% chance of preventing the flu. Even though one may still contract the influenza virus even after being vaccinated, the vaccine can reduce symptoms in those who get sick. This is important for people who are at higher risk of dying from the flu like infants and elderly due to weakened immune systems.

By Age Group

Figure 15



Source: MAVEN

Figure 15 shows the distribution of cases of influenza on Nantucket among different age groups. Children ages 5-9 and the over 60 age group had the highest incidences at 83.7 cases per 100,000. There were no cases reported in children under one year of age. From age 10 to 39 years, influenza is positively correlated with increasing age. Cases start declining at 40 years old and continues to decrease until age 60 when the number of cases increases significantly.

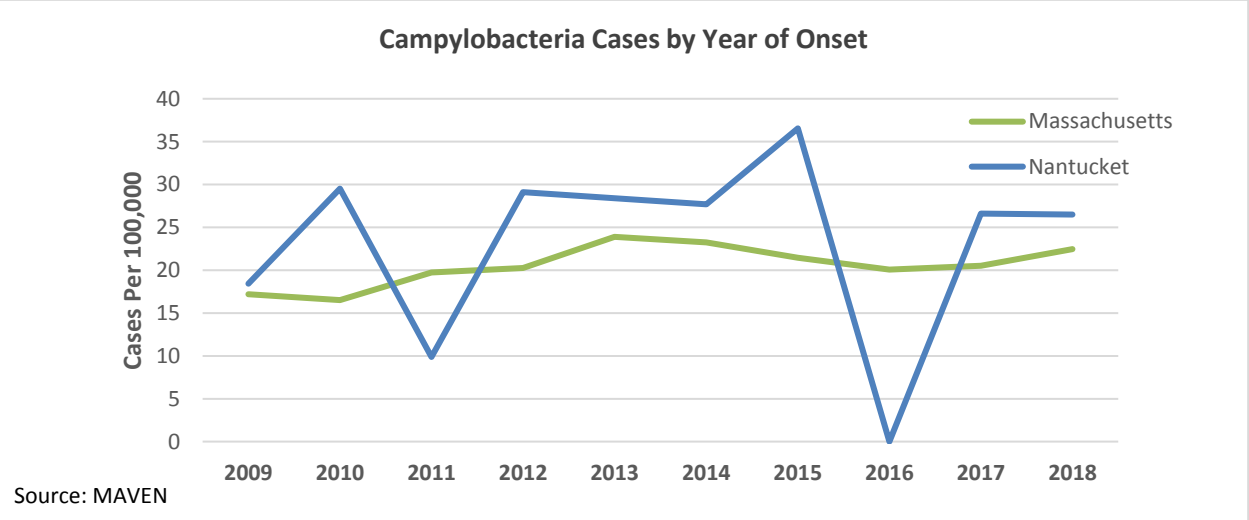
People aged 60+ may be too immunocompromised to receive the flu vaccination. This could account for more cases among this age group. Older adults also tend to go to the doctor more often which means they could have a more accurate reporting rate than other age groups. The high rate of influenza among the 5-9 age group could be explained by poor hygiene or bad germ sharing practices such as not covering one's mouth when coughing or sneezing, and not washing hands with soap. This age group is also more likely to go to the doctor if they are sick because their parents are in control of their care. There could be many other reasons for this spike in cases, however these age groups are normally more susceptible to illness because of their lifestyle practices and developing immune systems.

Campylobacteria

Campylobacteria is a virus caused by consuming undercooked or raw poultry or eating something that was contaminated by it. People can usually recover from this foodborne illness without treatment, however people with compromised immune systems are at risk for a more serious infection. For these people, the infection may spread to their bloodstream and could become life-threatening.

By Year of Onset

Figure 16



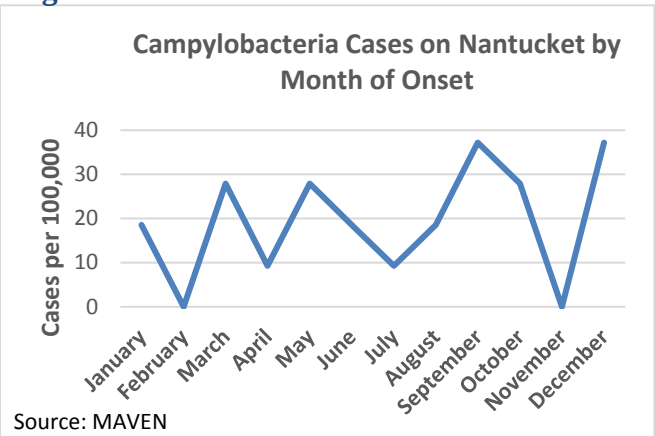
Source: MAVEN

The incidence of Campylobacteria in Massachusetts has stayed somewhat consistent between 2009 and 2018. There is a slight upward trend at the state level. In 2009, the incidence of Campylobacteria was 17.2 per 100,000 and in 2018 it was 22.4 per 100,000. On Nantucket, the incidence rates of Campylobacteria have been everchanging. There were two significant incidence rate declines in 2011 and 2016. The cumulative incidence of Campylobacteria on Nantucket was 232.5 per 100,000 while Massachusetts had a cumulative incidence of 205.5 per 100,000. While these cumulative rates are similar, the year to year data varies significantly. In 2018 and 2009, the state and Nantucket shared similar incidences. The largest difference in incidence rates occurred in 2016 when Nantucket had a rate of 0 per 100,000 and Massachusetts had a rate of 20.1 per 100,000.

By Month of Onset

Figure 17 shows the incidence of Campylobacteria on Nantucket by month. The only months that had no reported cases were February and November. The months with the highest incidence rates were September with a rate of 37.2 per 100,000 and December also with a rate of 37.2 per 100,000. Overall, the incidence rates of Campylobacteria seem to be very inconsistent throughout the year.

Figure 17

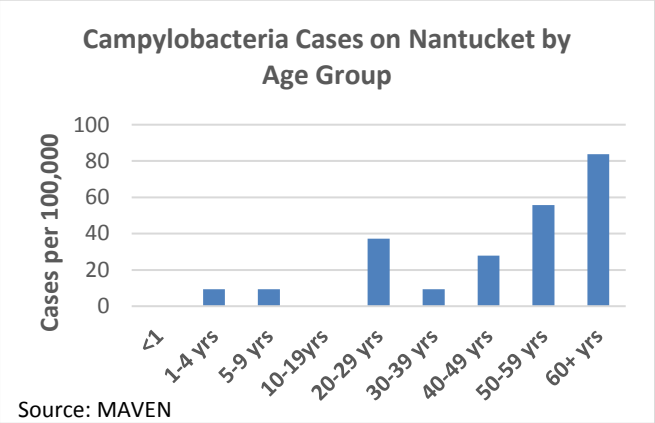


Source: MAVEN

By Age Group

There seems to be a positive correlation between Campylobacteria and older age. From ages 30-60+ there is a clear increase in incidence rates as age increases. There were no reported cases in children under 1 year of age or in children ages 10-19. There is a small spike in cases of Campylobacteria in young adults aged 20-29. Campylobacteria does not show clear patterns in younger age groups, however in the adult population, there is a clear association with higher rates of illness.

Figure 18



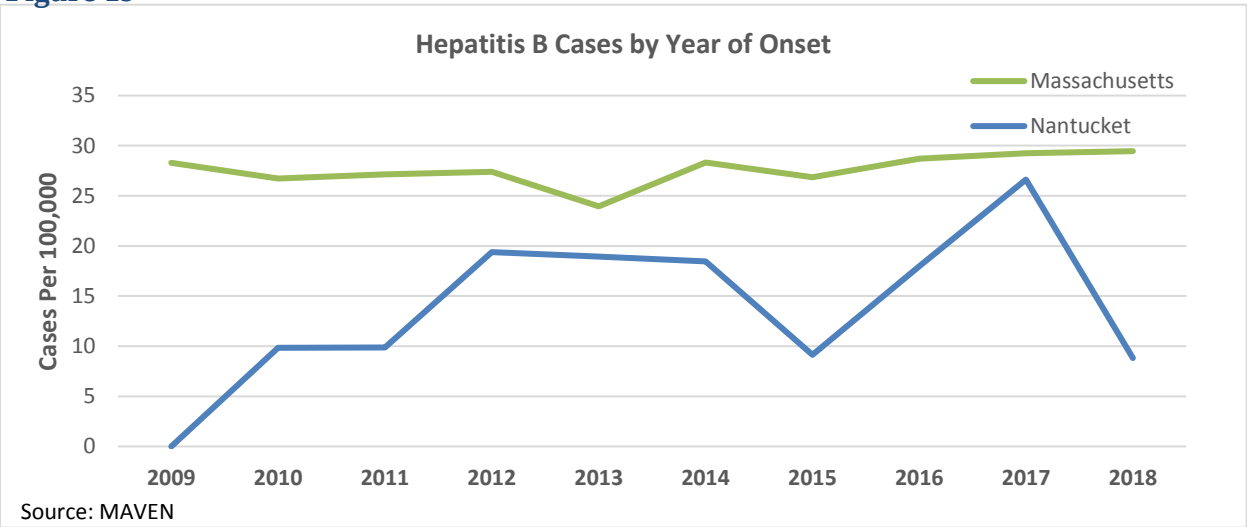
Source: MAVEN

Hepatitis B

Hepatitis B is a liver infection caused by the Hepatitis B virus. It is transmitted through blood, semen or any other infected bodily fluid that may enter the body of someone who is not infected. This disease can be either acute (short-term) or chronic (long-term). According to the Centers for Disease Control and Prevention, infants have a 90% of developing a chronic infection while only 2-4% of adults develop it. Hepatitis B is easily preventable by a vaccine. The Hepatitis B vaccine is 95% effective according to the Centers for Disease Control and Prevention.

By Year of Onset

Figure 19

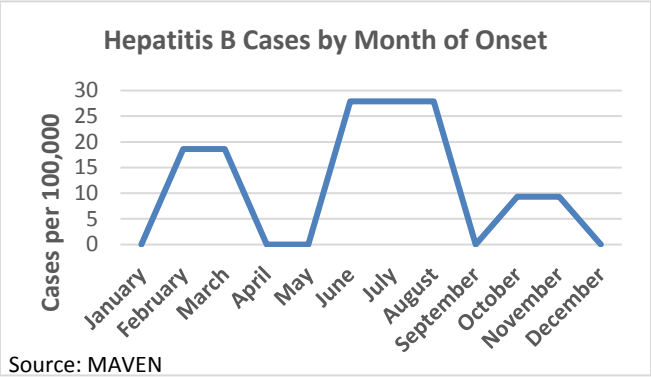


As seen in Figure 19, Massachusetts has a higher incidence rate of Hepatitis B when compared to Nantucket. At the state level, the cumulative incidence rate was 276.4 per 100,000 while Nantucket's cumulative incidence was 139.5 cases per 100,000. Hepatitis B in Massachusetts seems to have declined from 2009-2013. It has been increasing since 2013 and is continuing to increase at a slow rate. The highest reported incidence of Hepatitis B at the state level was in 2018 at 29.5 per 100,000. Nantucket's Hepatitis B incidence was increasing from 2009-2012 when it started to decline from 2013-2015. It reached a peak in 2017 with an incidence rate of 26.6 per 100,000 and declined again in 2018.

By Month of Onset

There seems to be three peaks of Hepatitis B throughout the year on Nantucket. The highest peak being June-August. A spike in Hepatitis B cases occurs in February and March as well as in October and November. There were no cases reported in April, May, September, or December. Based on the information in Figure 20, we can conclude that the shoulder months seem to have the least amount of cases apart from December.

Figure 20

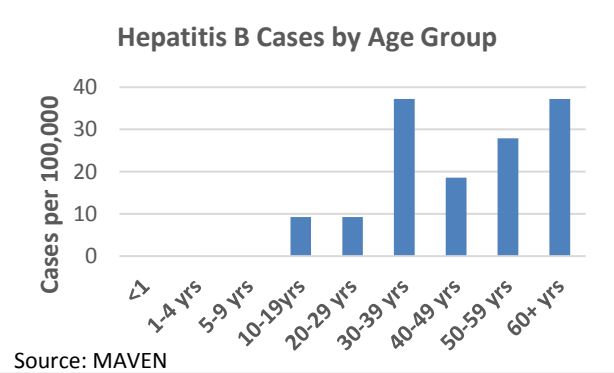


Source: MAVEN

By Age Group

When it comes to age of onset, Hepatitis B is more common in adults and is most common in adults ages 30-39 and 60+ (37.2 per 100,000). Between 2009 and 2018, there were no cases of Hepatitis B reported in anyone under the age of 10.

Figure 21



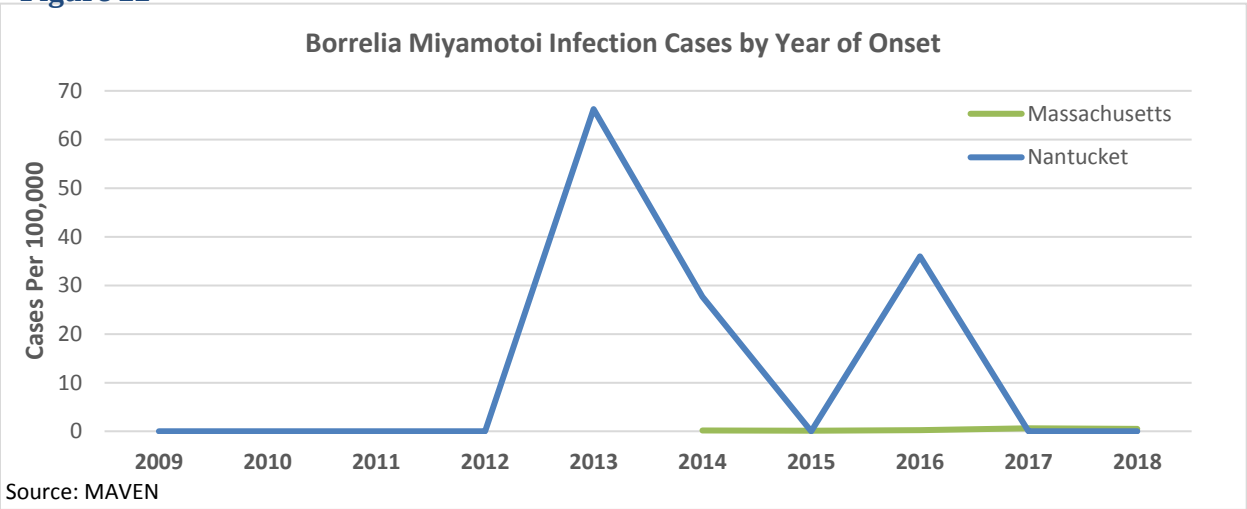
Source: MAVEN

Borrelia Miyamotoi Infection

Borrelia Miyamotoi is a species of bacteria that is closely related to the bacteria that cases tick-borne relapsing fever. It is also distantly related to the bacteria that causes Lyme Disease. According to the CDC, *B. Miyamotoi* originated in Japan and has been identified in two tick species: the black legged tick or "deer tick" and the western black-legged tick. Blacklegged ticks are the same ticks that transmit Lyme disease, Anaplasmosis, and Babesiosis which are all prominent in Massachusetts and Nantucket. *Borrelia Miyamotoi* bacteria causes flu like symptoms like many other tick-born illnesses do. Testing for *B. Miyamotoi* is not widely commercially available because diagnosis requires the use of polymerase chain reaction tests and antibody-based tests. This infection can successfully be treated with a 2-4-week course of antibiotics.

By Year of Onset

Figure 22



Source: MAVEN

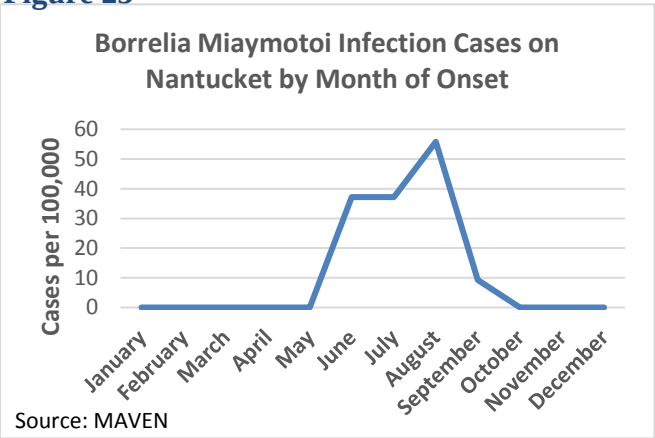
On Nantucket, there were no cases of Borrelia Miyamotoi until 2013 when the incidence rate went form 0 per 100,000 in 2012 to 66.24 per 100,000 in 2013. The incidence of Borrelia Miyamotoi on Nantucket decreased in 2014 and reached 0 cases per 100,000 again in 2015.

There was a quick spike in 2016 followed by no cases reported in 2017 and 2018. At the state level there is no data reported for Borrelia Miyamotoi until 2014. This is because Borrelia Miyamotoi was added to the reportable disease list in December 2013. The cumulative incidence rate of Borrelia Miyamotoi at the state level is much lower than the cumulative incidence rate on Nantucket (1.6 per 100,000 and 139.5 per 100,000 respectively). Cases in Massachusetts reached a peak of 0.6 per 100,000 in 2017.

By Month of Onset

With a higher prevalence in the summer months, Borrelia Miyamotoi follows the same trend as Nantucket's other tick-born illnesses. Cases are nonexistent from October through May. Borrelia Miyamotoi cases increase in June and reach a peak in August with an incidence rate of 55.8 per 100,000. This tick-born illness seems to have a longer range of infection with cases carrying into September.

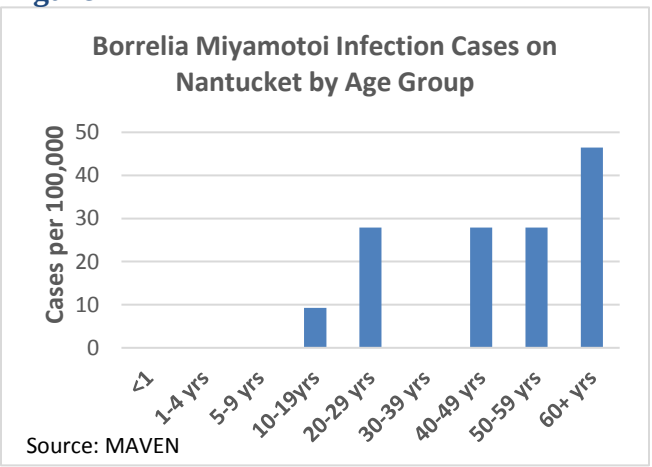
Figure 23



By Age Group

There were no cases reported on Nantucket from 2009-2018 in anyone under the age of 10 or anyone from ages 30-39. The incidence rates for ages 20-29, 40-49, and 50-59 were the same at 27.9 per 100,000, The over 60 population had the highest incidence rate at 46.5 per 100,000. This population had the highest incidence rates of disease for all reportable tick-born illnesses (Lyme, Babesiosis, Human Granulocytic Anaplasmosis, and Borrelia Miyamotoi). This pattern may be caused by a lack of education and awareness in Nantucket's older adult population.

Figure 24

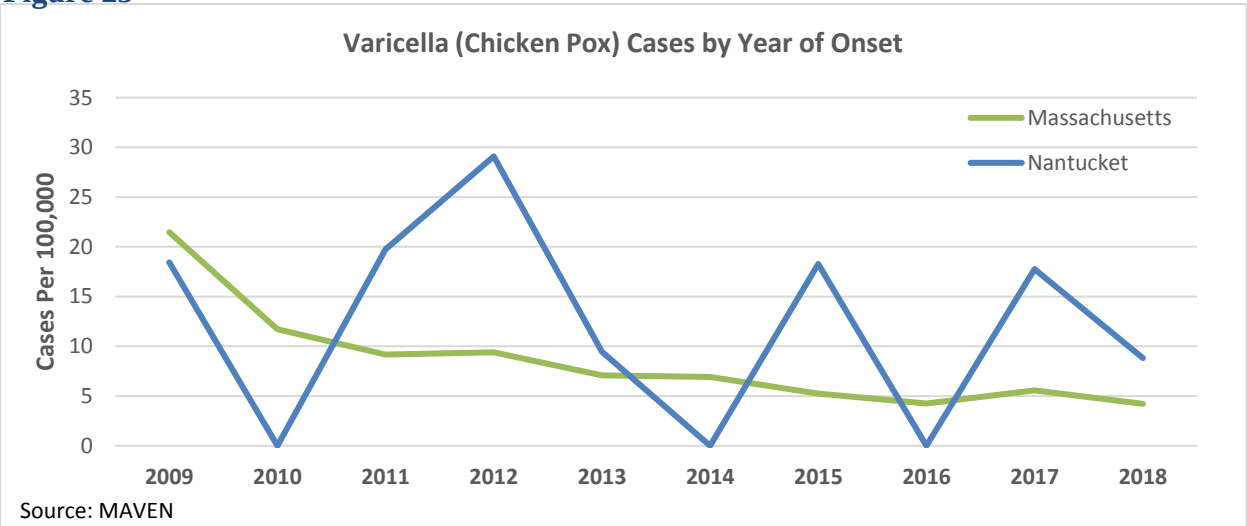


Varicella (Chicken Pox)

Varicella, more commonly known as chicken pox, is a viral infection that is highly contagious to those who have not been vaccinated against it. Chicken pox used to be a very widespread disease in the United States with about 4 million cases each year in the 1990s. Now, Varicella is a rare disease in the United States with less than 200,000 cases each year according to the CDC. The decline in Varicella is directly related to the development of the chicken pox vaccine in 1995. With proper vaccination, a person's risk of contracting Varicella decreases by 90%. People who contract Varicella have an increased risk of developing Varicella-zoster (shingles) later in life. Shingles is caused by the reactivation of the Varicella infection. People who never contract Varicella will not develop shingles.

By Year of Onset

Figure 25

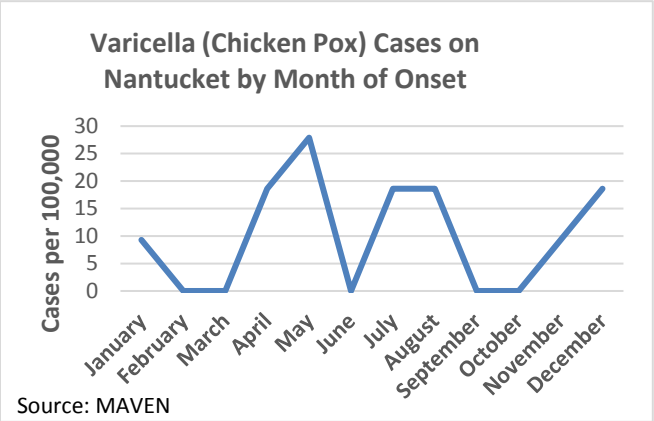


In Massachusetts, Varicella has been on the decline since 2009. The highest reported incidence was in 2009 with an incidence rate of 21.5 per 100,000. The lowest reported incidence at the state level was in 2018 with an incidence of 4.2 per 100,000. On Nantucket, the incidence of Varicella has not been as straightforward as it has been at the state level. There were no cases of Varicella reported in 2010, 2014, and 2016. The most cases were reported in 2012 with an incidence rate of 29.1 per 100,000.

By Month of Onset

On Nantucket, the most cases of Varicella were reported in May with an incidence rate of 27.9 per 100,000. There were no cases of Varicella reported in February, March, June, September, or October. There was a spike in case numbers in April, May, July, August and December. Most cases were reported in the warmer months.

Figure 26

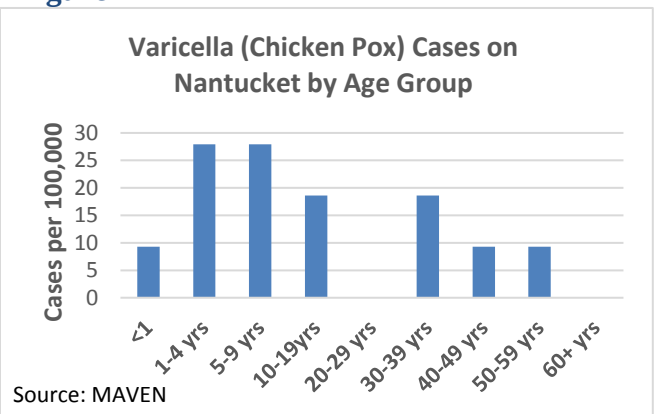


Source: MAVEN

By Age Group

Varicella is one of the few infectious diseases on Nantucket that affects the younger population. The highest incidence of Varicella was reported in ages 1-9 (27.9 per 100,000). 70% of all Varicella cases on Nantucket were reported in people ages <1 to 19. There were no cases reported in the over 60 population.

Figure 27



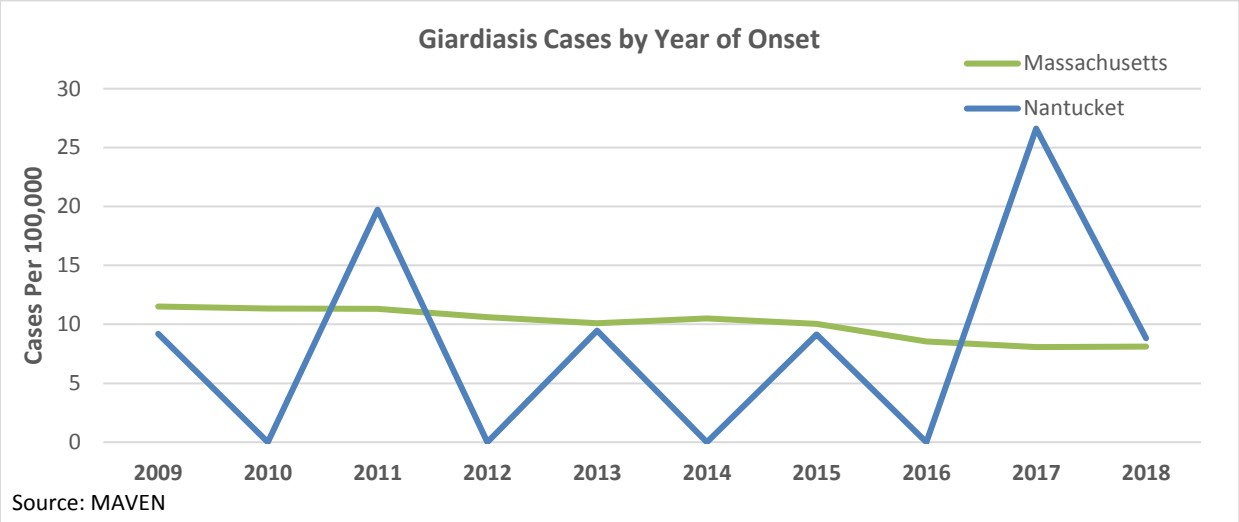
Source: MAVEN

Giardiasis

Giardiasis is diarrheal illness caused by the parasite *giardia*. This parasite is found in food or water that has been contaminated by infected human or animal feces. Giardiasis is more common in countries with underdeveloped sanitation and water purifying systems, however it is also found in the United States. The most common mode of transmission is by consuming contaminated water.

By Year of Onset

Figure 28

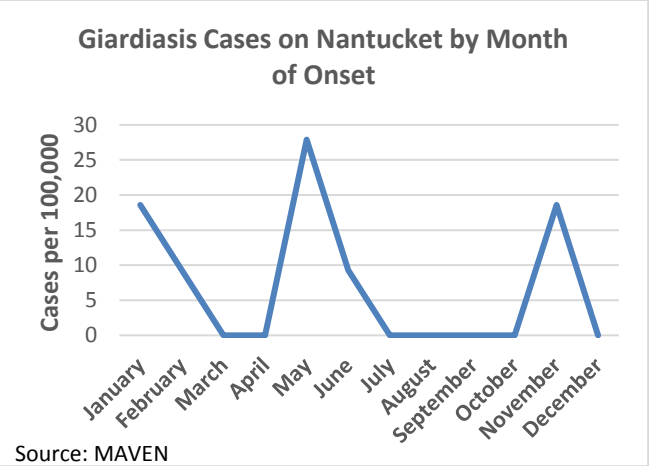


In Massachusetts, the incidence of Giardiasis has declined slightly since 2009. The highest reported incidence between 2009 and 2018 was in 2009 at 11.5 per 100,000. The lowest reported incidence rate at the state level was in 2018 at 8.8 per 100,000. On Nantucket, there have been spikes in Giardiasis every other year. There were no reported cases in 2010, 2012, 2014, and 2016. The highest spike in cases occurred in 2017 with an incidence of 26.6 per 100,000. In 2011 and 2017, the incidence of Giardiasis on Nantucket was higher than the incidence at the state level.

By Month of Onset

The most cases of Giardiasis were reported on Nantucket in May (27.9 per 100,000). There were three spikes in cases throughout the year: May, November, and January. There were no cases reported in March, April, July, August, September, October or December.

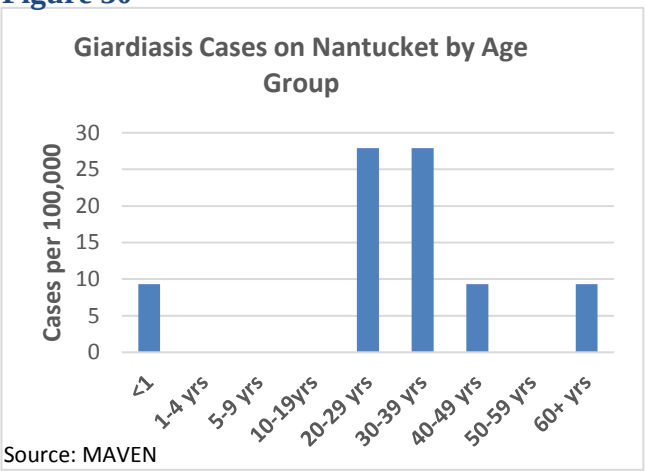
Figure 29



By Age Group

The highest incidence of Giardiasis occurred within the 20-29 and 30-39 age groups with an incidence rate of 27.9 per 100,000. The three other age groups with reported cases have incidence rates of 9.3 per 100,000. There were no cases reported in people aged 1-19.

Figure 30

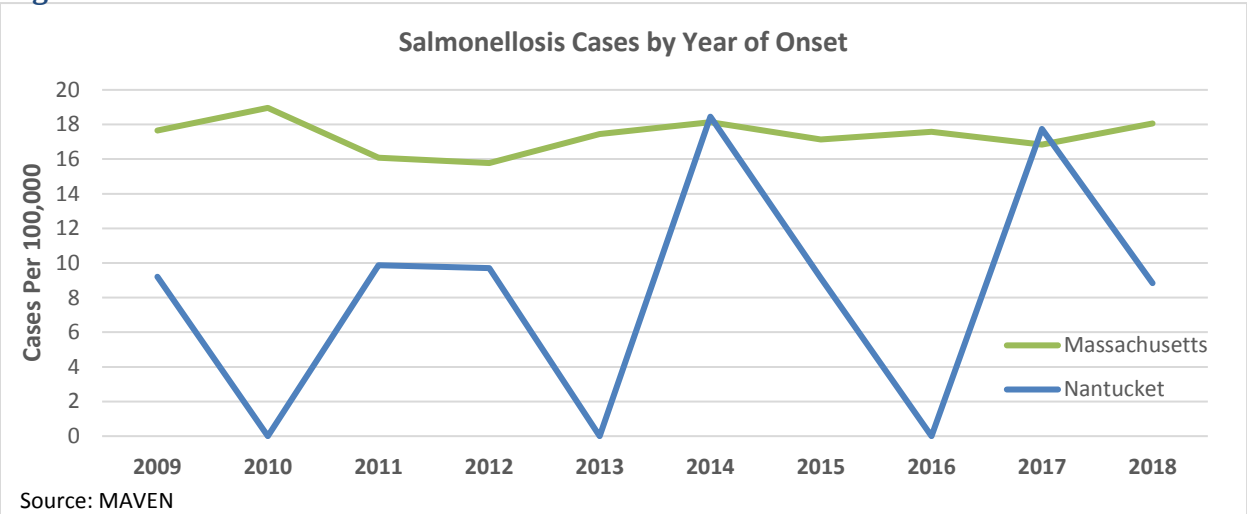


Salmonellosis

Salmonellosis is an illness caused by a *Salmonella* bacterial infection. The illness usually lasts 4 to 7 days and normally resolves without treatment. In some cases, the illness can become severe and the infection can spread to the bloodstream. Patients with this severity should be treated promptly with antibiotics to avoid major complications and even death. Some populations are at a higher risk for a more severe infection including infants, elderly, and people with a weakened immune system. Salmonella bacteria is found in contaminated meat, eggs or milk. It is completely preventable with proper food handling and pasteurization practices.

By Year of Onset

Figure 31

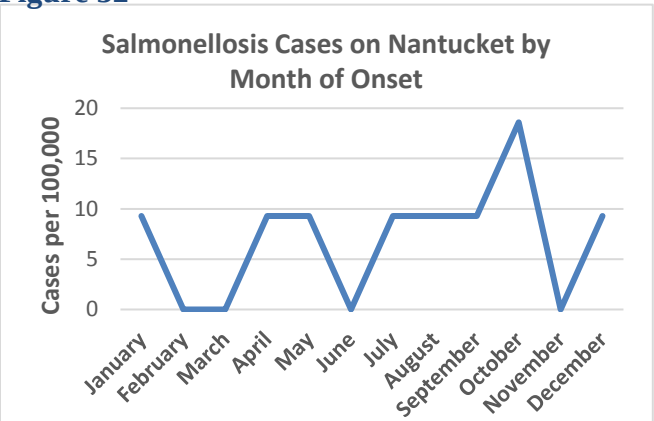


With the exception of 2014 and 2017, Massachusetts has a higher incidence of Salmonellosis when compared with Nantucket. The highest reported incidence of Salmonellosis in Massachusetts was in 2010 with an incidence rate of 19.0 per 100,000. On Nantucket, the highest reported incidence was in 2014 at 18.5 per 100,000. There were no reported cases on Nantucket in 2010, 2013, or 2016.

By Month of Onset

On Nantucket, the most cases of Salmonellosis were reported in the month of October with an incidence rate of 18.6 per 100,000. There were no cases reported in February, March, June, or November. There was a steady increase in cases from July to October which includes the warmest months on Nantucket.

Figure 32

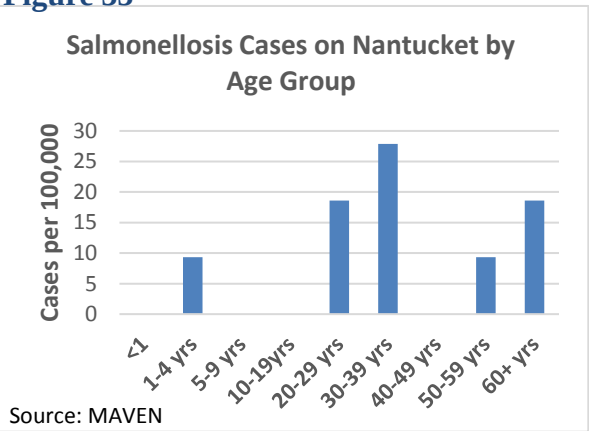


Source: MAVEN

By Age Group

According to the CDC, children under 5 have the most cases of Salmonellosis nationwide. This differs from Nantucket where people ages 30-39 are the most affected. The majority of cases on Nantucket occur in people 20-39 years old. There is also a relatively high incidence rate among people aged 60 and over (18.6 per 100,000). As previously stated, Salmonellosis is most dangerous in people with weaker immune systems such as infants and elderly. Since most of Nantucket's cases are among young adults, Salmonellosis is not of grave concern to the island's health. However, since it is completely preventable with proper food handling, it is possible to eliminate Salmonellosis all together.

Figure 33



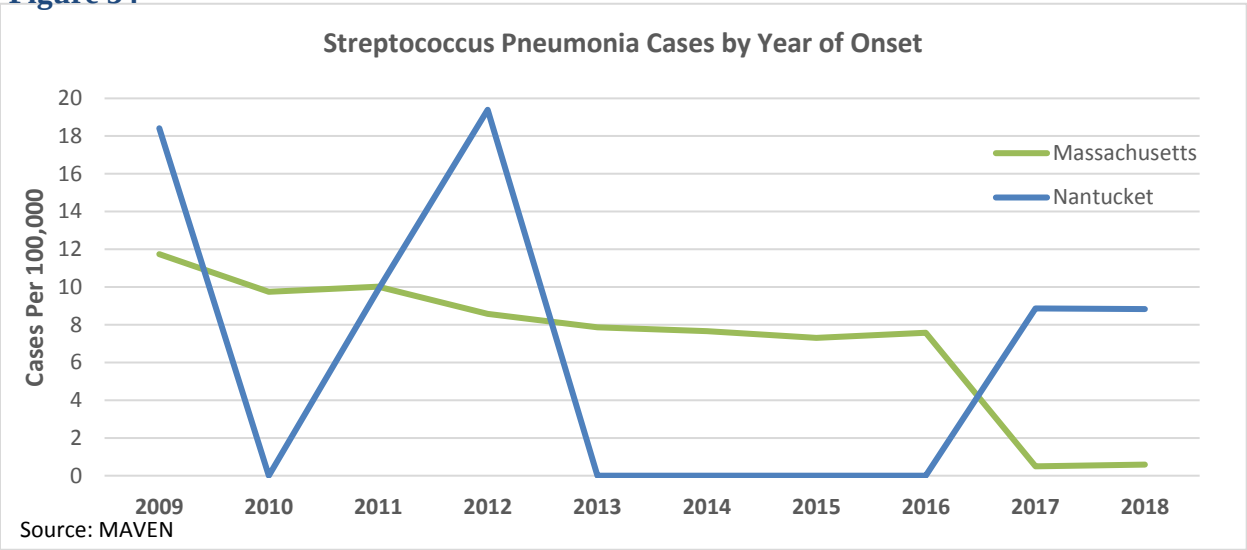
Source: MAVEN

Streptococcus Pneumonia

Streptococcus pneumoniae bacteria, or pneumococcus, can cause many types of illness, some of which are life-threatening. Pneumococcus is the most common cause of bloodstream infections, pneumonia, meningitis, and ear infections in young children according to the CDC. Although pneumococcus is most common in children nationwide, adults with chronic illness, weakened immune systems, and who smoke cigarettes are at a higher risk of developing this infection. Also, adults over the age of 65 have a higher risk. Pneumococcus is spread from person to person through direct contact with an infected person's saliva or mucus.

By Year of Onset

Figure 34

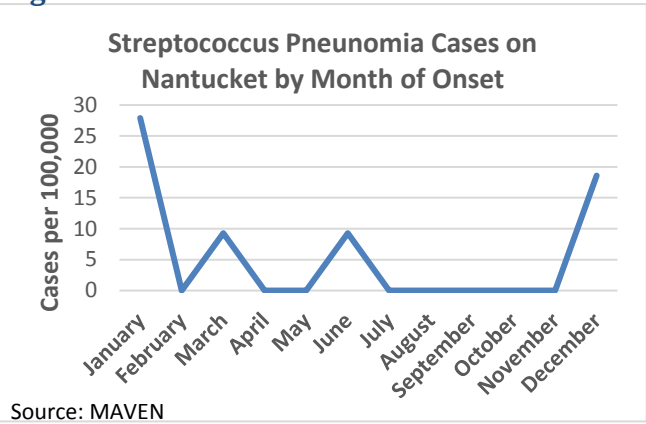


Since 2009, Massachusetts has seen a decline in the incidence of Streptococcus Pneumonia. On Nantucket, incidence rates were very variable from 2009 to 2013. From 2013 to 2016, there were no reported cases of Streptococcus Pneumonia on Nantucket. In 2017 cases on Nantucket spiked just as cases at the state level sharply decreased. From 2016 to 2018 the data from Nantucket and Massachusetts is almost completely opposite. Just as cases in Massachusetts decreased, cases on Nantucket increased.

By Month of Onset

Case of Streptococcus Pneumonia (SP) on Nantucket spiked in December and January. There were two small increases in the incidence of SP in March and June. It is clear that Streptococcus pneumoniae bacteria is more common during the winter months. The highest incidence rate was recorded in January at 27.9 per 100,000. There were no reported cases in 66% of the year. The longest stretch without any reported cases was from July to November.

Figure 35

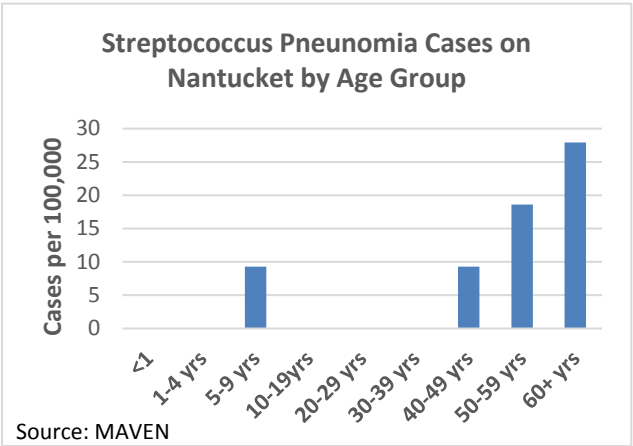


Source: MAVEN

By Age Group

Streptococcus Pneumonia on Nantucket is most prevalent in the older adult population. The over 60 age group has the highest reported incidence rate at 27.9 per 100,000. Although there were cases reported in the 5-9 age group, these cases on account for 14.3% of total cases. There is a positive correlation associated with Streptococcus Pneumonia and older age. Nationwide, SP is most common among children which is not the case on Nantucket. Older populations, especially over 65, are more susceptible to SP because they have a higher chance of being immunocompromised.

Figure 36



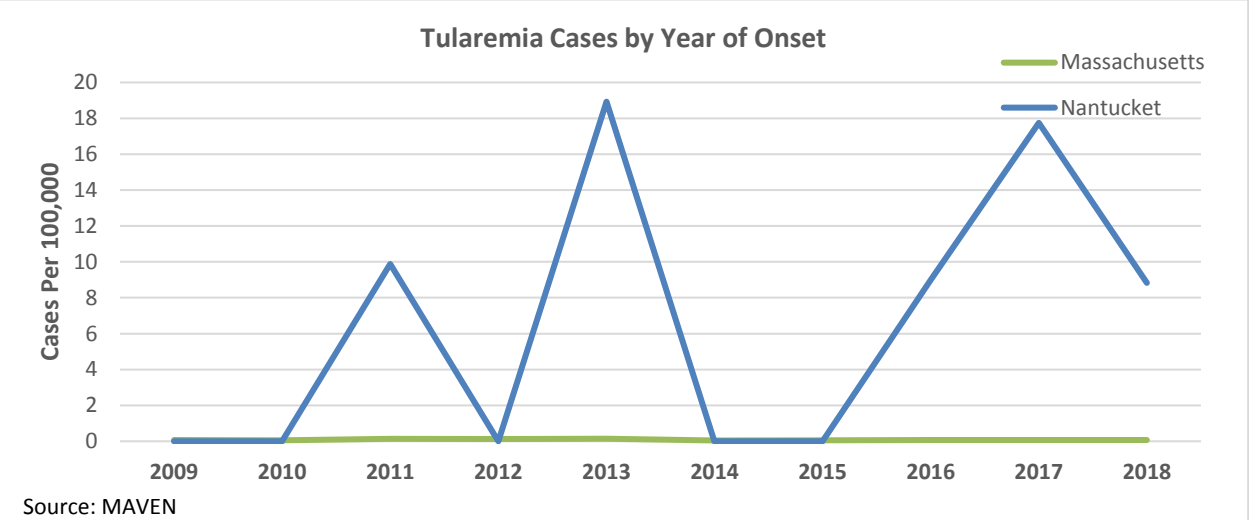
Source: MAVEN

Tularemia

Tularemia is an infectious disease that had been known to affect animals and people. There are several ways people can become infected with Tularemia such as tick and deer fly bites, skin contact with infected animals, drinking contaminated water, and inhaling contaminated aerosols or landscaping dust. Symptoms vary depending on the mode in which a person develops the infection. While Tularemia can be life-threatening, most infections can be treated with antibiotics. On Nantucket we can assume most Tularemia cases are tick-related due to the high incidence of other tick-born illnesses and an unusually large tick population.

By Year of Onset

Figure 37



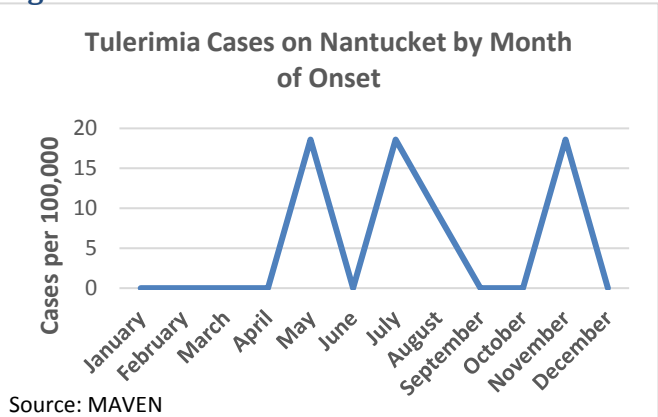
Source: MAVEN

Nantucket has a much higher incidence of Tularemia when compared to Massachusetts. Nantucket's cumulative incidence rate is 65.1 per 100,000 compared to 0.8 per 100,000 at the state level. While Massachusetts has a consistently low rate of Tularemia, Nantucket has had three spikes since 2009: in 2011, 2013, and 2017. The highest recorded incidence rate on Nantucket was in 2013 at 18.9 per 100,000. As of 2018, Tularemia seems to be on the decline on Nantucket, however more data will be needed in the future to better understand the decline.

By Month of Onset

Tularemia does not follow the same pattern as other tick-born illnesses when it comes to month of onset. The highest incidence rates were recorded in May, July, and November at 18.6 per 100,000. Usually tick-born illnesses peak in the Spring and Summer although they can be spread at any time of the year. Tularemia is a much rarer disease when compared to Lyme, Babesiosis and Human Granulocytic Anaplasmosis which could explain its irregularity.

Figure 38

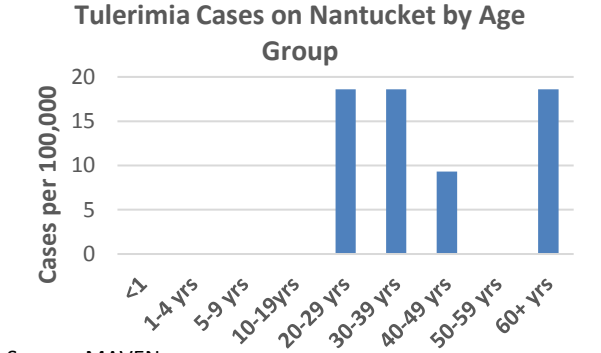


Source: MAVEN

By Age Group

On Nantucket, Tularemia affected only adults between 2009 and 2018. There were no reported cases in anyone under the age of 20. The highest incidence rate of Tularemia was reported in the 20-29, 30-29, and over 60 populations at 18.6 per 100,000.

Figure 39



Source: MAVEN

Non-Reportable Infectious Diseases

On Nantucket between 2009 and 2018, there were 32 different infectious diseases reported. The following diseases had case numbers too small to report:

Arbovirus
Caliciviral/Norovirus Infection
Cryptococcus
Cryptosporidiosis
Cyclosporidiosis
Group A Streptococcus Infection
Group B Streptococcus Infection
Hepatitis A
Hepatitis E
Legionella
Lymphocytic Choriomeningitis
Measles
Meningococcal Disease
Pertussis
Shiga Toxin Producing Organism Infection
Shigellosis
Toxoplasmosis
Viral Meningitis
Yersinosis